



CMS Electronics Week

The CMS Low Voltage System

S. Lusin

University of Wisconsin



The fundamental issues ...

Magnetic field

- Existence of ambient field resulted in emphasis on DC-oriented design solutions during early phases of project
- Low level field is everywhere, nowhere to hide

Radiation

- Problems with single-event burnout during beam tests

Mobility of barrel rings & endcap disks

- Require up to 10m move

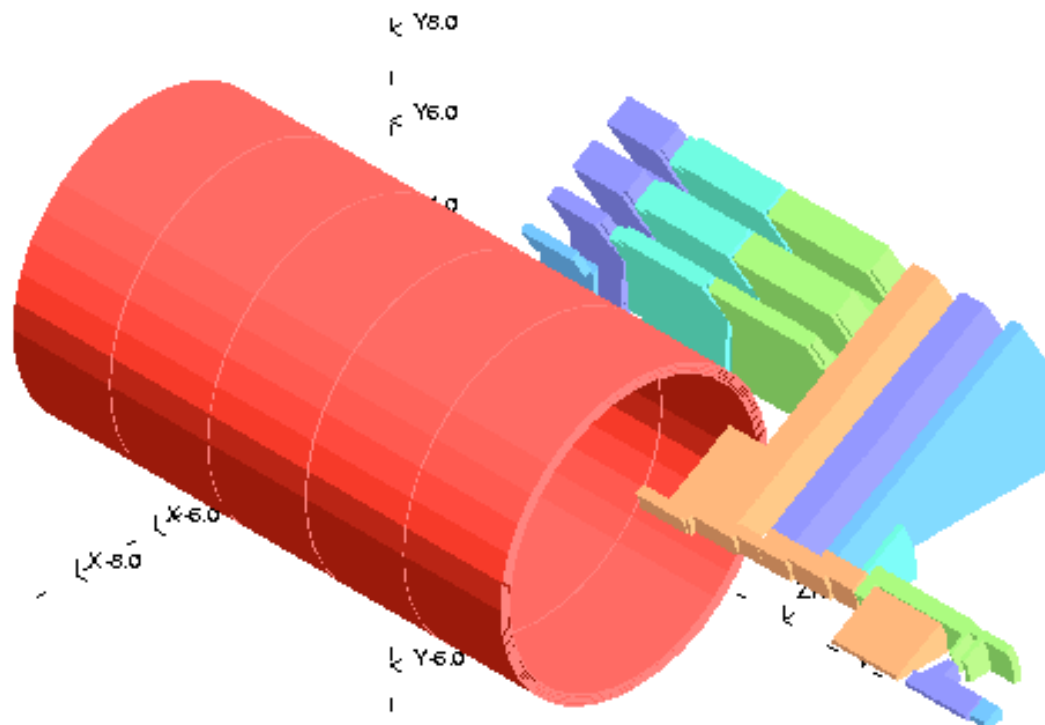
Low voltage, high current

- High Ohmic losses

System cost ...



TOSCA Model Description

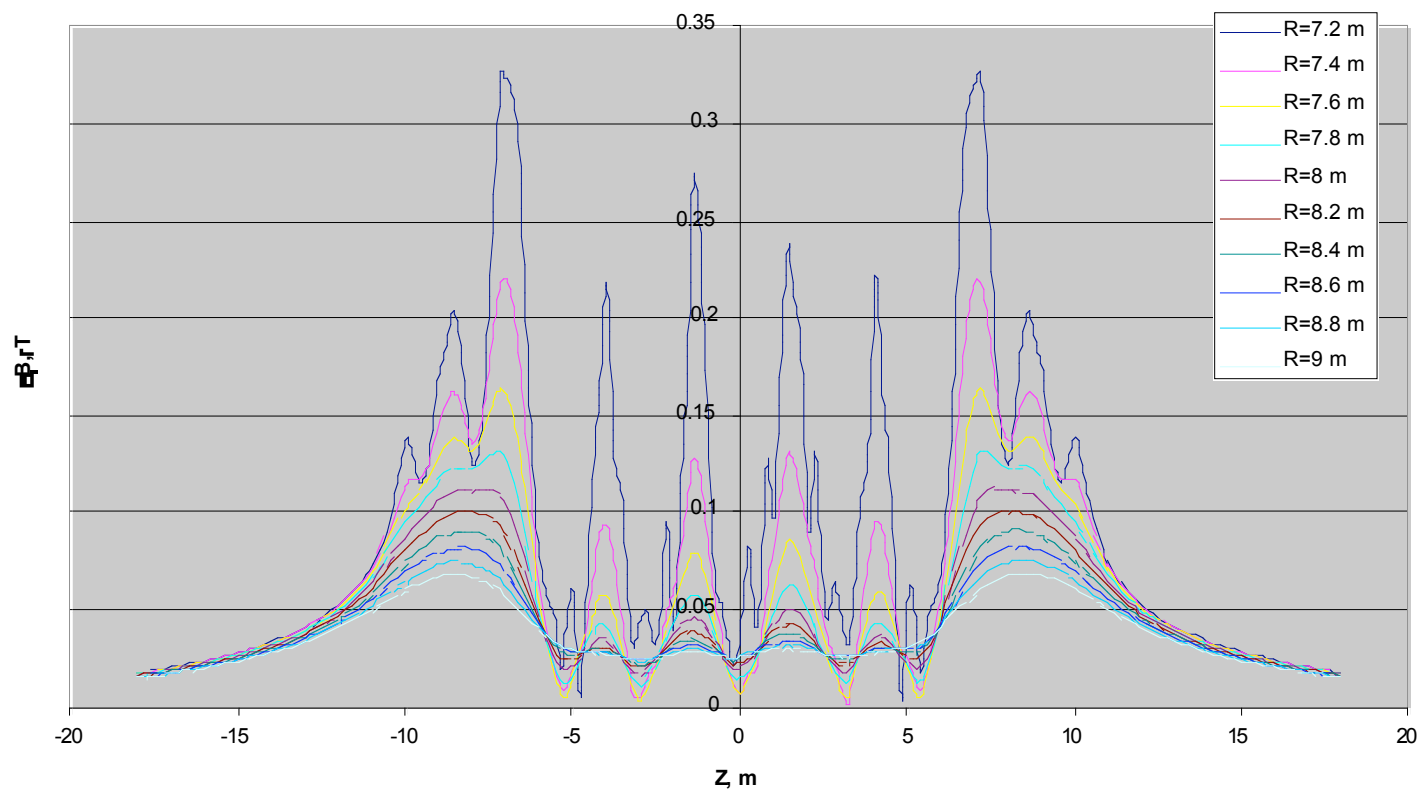


From V. Klioukhine



Total Stray Fields Outside the Yoke

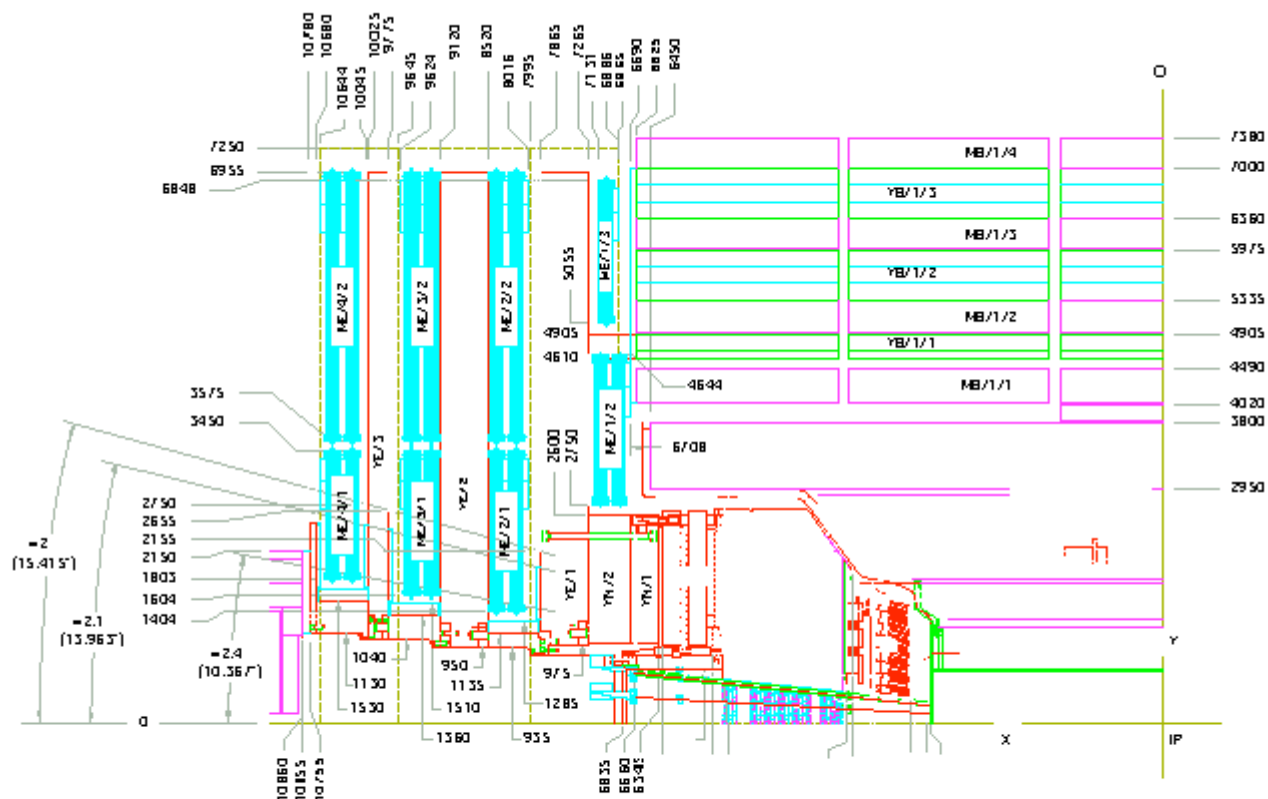
Total stray fields outside the yoke in a vertical plane



From V. Klioukhine



One-quadrant cross-section



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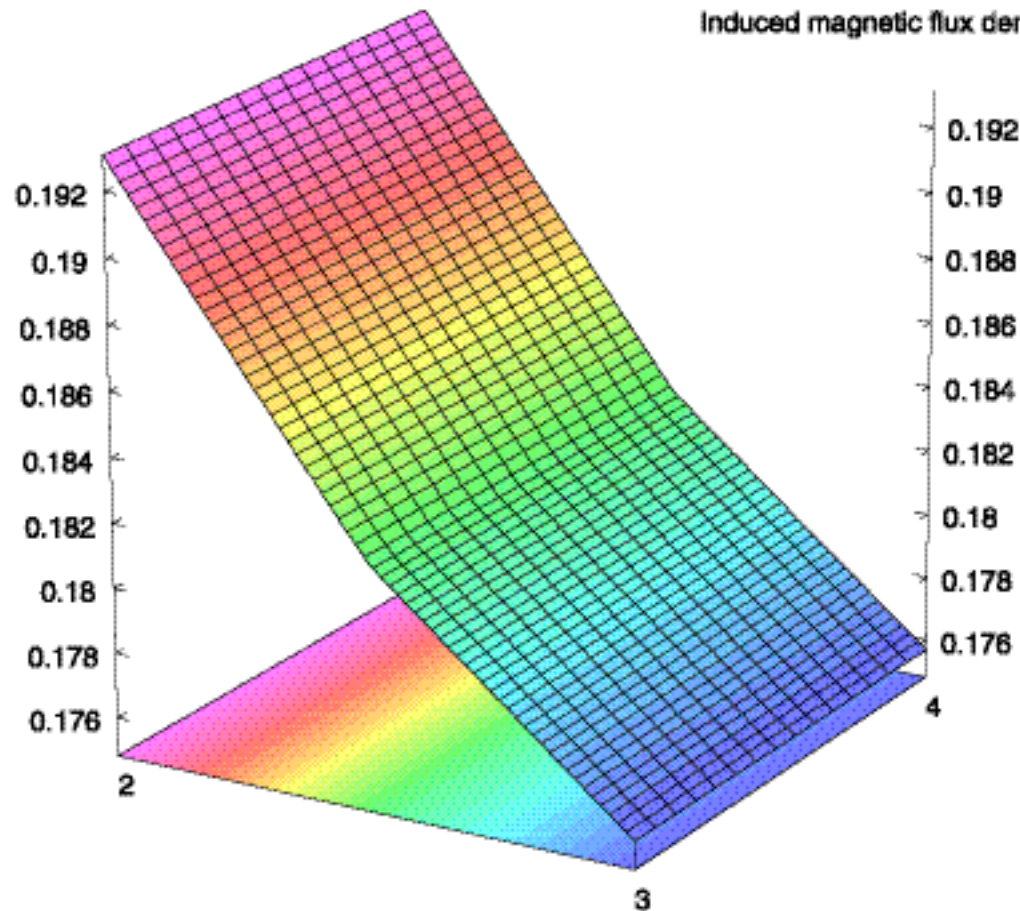


JDP 12-7-99
CMS 5185_090



Magnetic FEA Results

Induced magnetic flux density (T) in central middle plane



1=0.0001
7.56858
7.53335
2=0.01514
7.56858
7.53335
3=0.01514
7.56858
7.59665
4=0.0001
7.56858
7.59665
Cartesian

Transformer in
central vertical plane,
over YE1 at Y=7.5m

Winding axes are
vertical

Component: BMOD
Minimum = 0.175683, Maximum = 0.193076
Integral = 0.000174559

Max. Field is ~10% of full saturation value

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VF OPERA-3d
Post-Processor 7.1



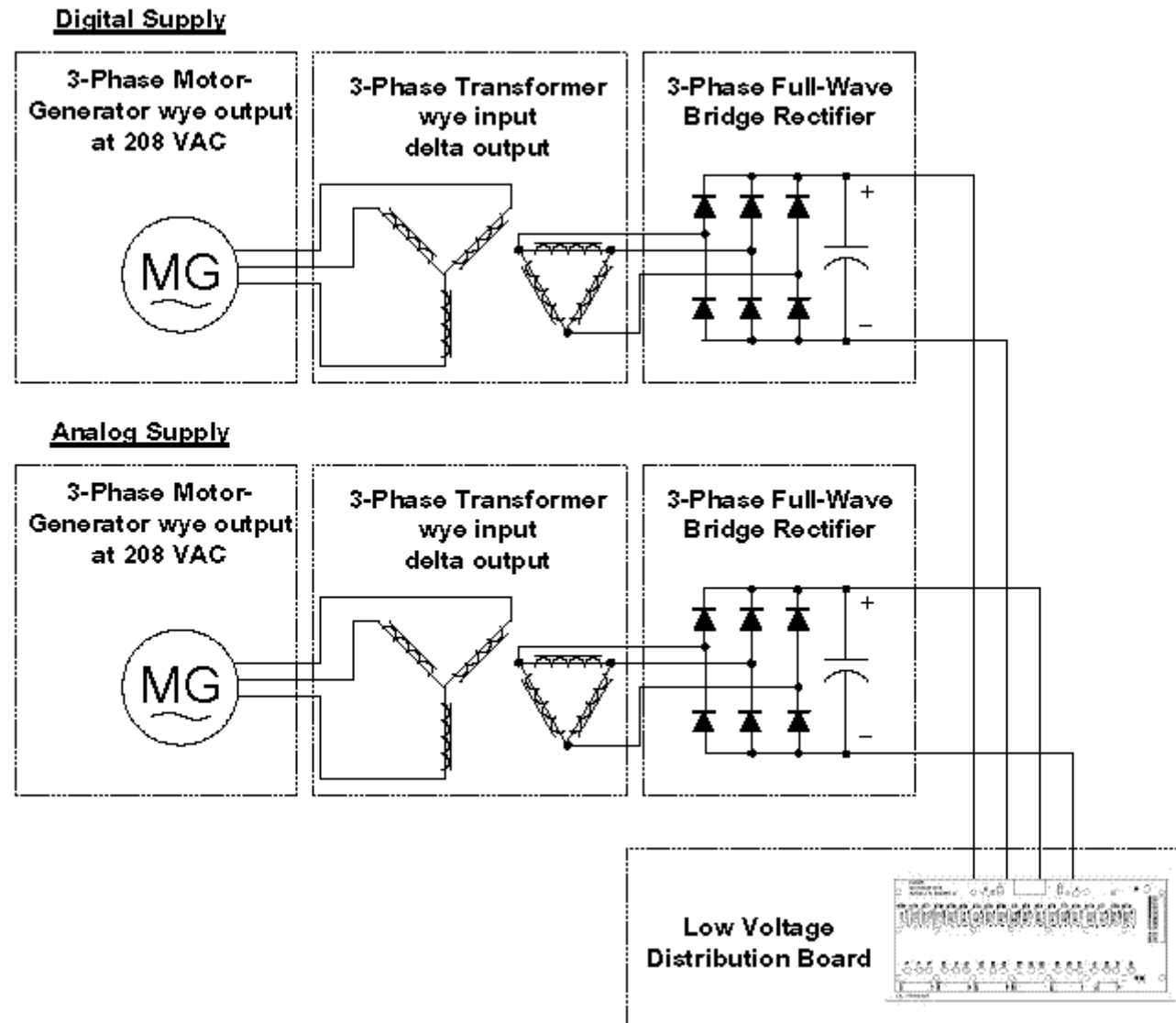
AC-DC Supply Overview

400 Hz AC would be supplied by motor-generators located in region of low magnetic field.

Transformers would be mounted on the endcap walkways or in towers.

- Transformer would be operated in a derated mode
- May require some magnetic shielding

Rectifiers and filters would be located at transformer

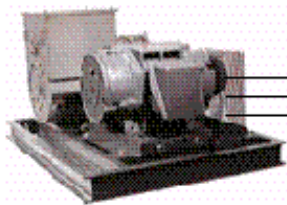




LV Supply Components

Digital Supply

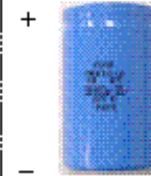
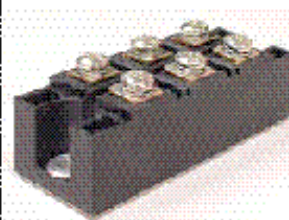
3-Phase Motor-
Generator wye output
at 208 VAC



3-Phase Transformer
wye input
delta output

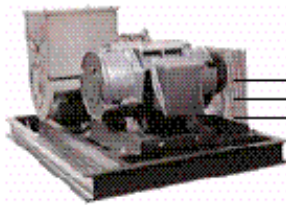


3-Phase Full-Wave
Bridge Rectifier



Analog Supply

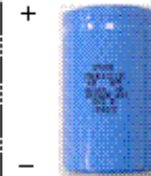
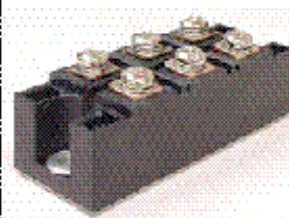
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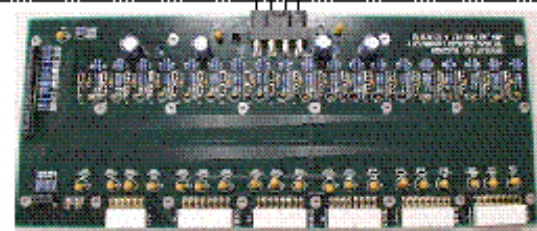
3-Phase Transformer
wye input
delta output



3-Phase Full-Wave
Bridge Rectifier



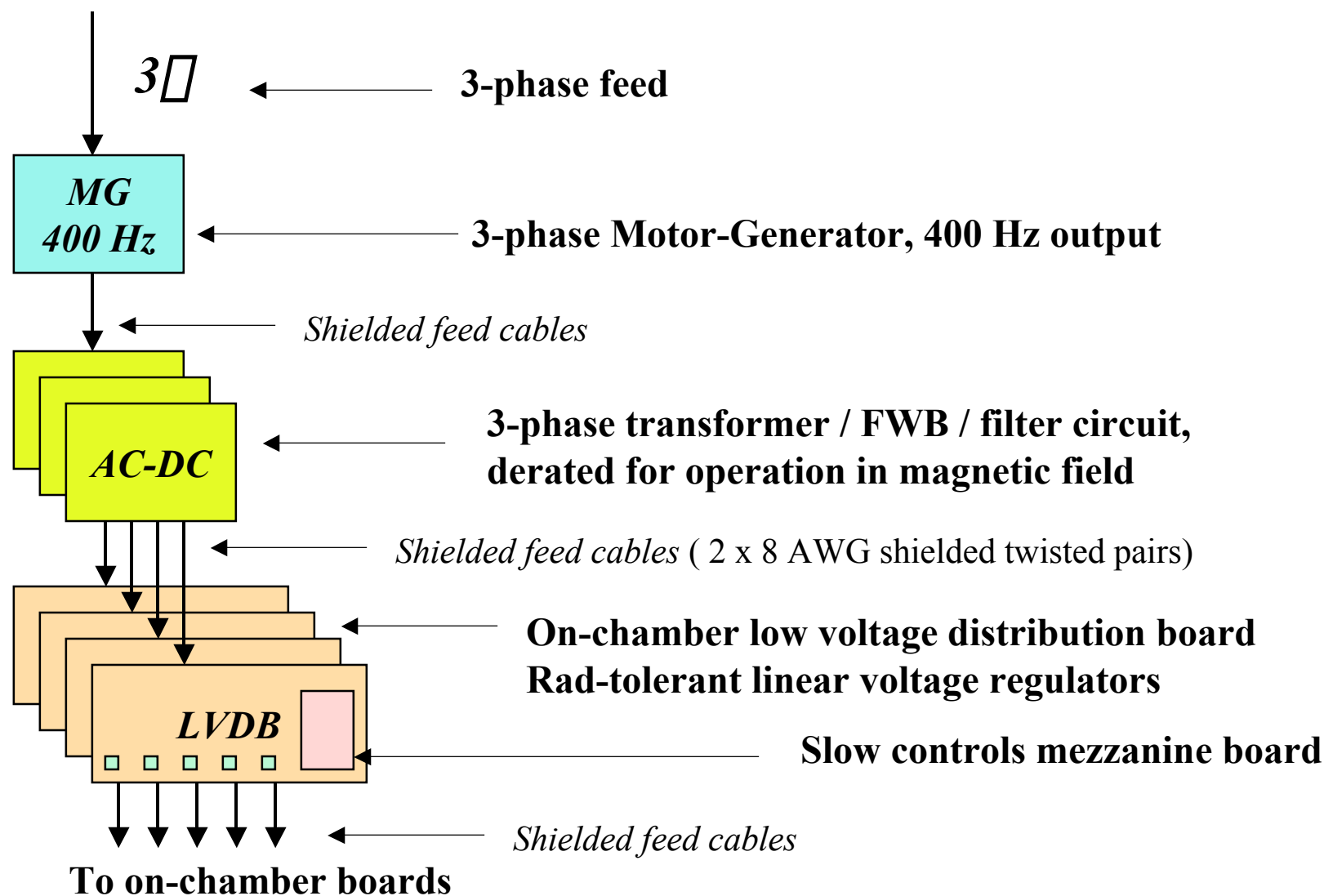
Low Voltage
Distribution Board



*Regulation
exists at the
two ends of
the system.
Intermediate
components
are dumb
and reliable.*



AC-DC LV System Overview





Current status ...

- Fermilab has engineering manpower available**
- Willing to devote resources to development of common low-voltage solution**
- Need coordination of subdetectors in design process**
- Need integrated design**